Issue date: 18 August 2023
Valid until: 1 July 2028

NO: SAMM 111

LABORATORY LOCATION:
(PERMANENT LABORATORY)

SPECTRUM LABORATORIES (PENANG) SDN. BHD.
1904 TINGKAT 1, JALAN BUKIT MINYAK
TAMAN SRI MANGGA
14000 BUKIT MERTAJAM
SEBERANG PRAI TENGAH
PULAU PINANG, MALAYSIA

FIELDS OF TESTING: **CHEMICAL AND MICROBIOLOGY**

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Effluent / Water	Arsenic as As	ASTM D2972-88 A
	Biochemical Oxygen Demand (BOD)	APHA 5210B /4500 O-G
	Boron as B	APHA 4500-B,C
	Chromium, Hexavalent	APHA 3500 Cr-B
	Chromium, Trivalent	In-house method No. 5 based on APHA 3500 Cr-B
	Chemical Oxygen Demand	APHA 5220 C
	Cyanide as CN	OSRMA P.456
	Free Chlorine	APHA 4500-CI F
	Oil & Grease	APHA 5520 B
	pH	APHA 4500-H^+ B
	Nitrite as N / as NO_2	APHA 4500-NO_2 B
	Total Hardness as $CaCO_3$	APHA 2340 C
	Phosphorus as P and Phosphate as PO_4	APHA 4500-P,B & APHA 4500-P,C

SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued)		
• Effluent / Water	Sulphate as SO_4	APHA 4500 SO_4 E
	Phenol	APHA 5530-B,C
	Sulphide as S^{2-}	APHA 4500 - S^{2-} F
	Aluminium as Al	APHA 3500 Al-B
	Ammonia as NH_3	APHA 4500 NH_3 - B,C
	Preliminary Treatment of Samples : Nitric Acid – Hydrochloric Acid Digestion	APHA 3030-F
	Chloride as Cl	APHA 4500-Cl C
	Fluoride as F	APHA 4500-F D
	Molybdate Reactive Silica as SiO_2	APHA 4500 SiO_2 D
	Dissolved Oxygen	APHA 4500 O-G
	Total Organic Carbon (TOC)	APHA 5310-C Persulfate-Ultraviolet or Heated-Persulfate Oxidation Method
	Anionic Surfactant as MBAS	APHA 5540 C
	Total Alkalinity P- Alkalinity m- Alkalinity	OSRMA p.334 - 336
	Bicarbonate Alkalinity Carbonate Alkalinity Hydroxide Alkalinity Free Carbon Dioxide Total Carbon Dioxide	APHA 4500 CO_2 D

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) • Effluent / Water	**Metals by Inductively Coupled Plasma (ICP) Method:** Aluminium as Al Antimony as Sb Arsenic as As Barium as Ba Beryllium as Be Boron as B Cadmium as Cd Calcium as Ca Chromium as Cr, Total Cobalt as Co Copper as Cu Iron as Fe Lead as Pb Lithium as Li Magnesium as Mg Manganese as Mn Molybdenum as Mo Nickel as Ni Potassium as K Selenium as Se Silver as Ag Silicon as Si Silica as SiO2 Sodium as Na Strontium as Sr Thallium as Tl Vanadium as V Zinc as Zn	APHA 3120 B
	Tin Bismuth as Bi Gallium as Ga Indium as In Phosphorus as P (or PO_4)	In-house method No. 4 based on APHA 3120 B

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) • Effluent / Water	Mercury	In-house method No. 3 based on APHA 3120 B
	Total Acidity p- Acidity m- Acidity	APHA 2310 B
	Nitrate as N / as NO_3	APHA 4500 NO_3 B
	Nitrate as N / as NO_3	APHA 419 D (14^{th})
	Turbidity	APHA 2130 B
	Hardness by calculation	APHA 2340 B
	Total Kjeldahl Nitrogen	APHA 4500 Norg A
	Organic Nitrogen	APHA 4500 Norg B
	Total Nitrogen	In-house method No. 7 (based on APHA 4500 Norg B, APHA 4500 NO_2B, APHA 4500 NH_3 B C, APHA 419D 14^{th})
	Formaldehyde	HACH SPECTROPHOTOMETER Method 8110
	Formaldehyde	OSRMA p.458
	Color (ADMI)	APHA 2120 F
	Barium	HACH SPECTROPHOTOMETER Method 8014

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued) • Effluent / Water	Total Chromium	HACH SPECTROPHOTOMETER Method 8024
	Chromium, Hexavalent	HACH SPECTROPHOTOMETER Method 8023
	Chromium, Trivalent	In-house method No. 6 based on HACH SPECTROPHOTOMETER Method 8024 / Method 8023
	Cyanide	APHA 4500 – CN^- C and F
	Tin	APHA 3111B/ Direct Air-Acetylene Flame Method
	Calcium as Ca Chromium, Total Cadmium as Cd Copper as Cu Iron as Fe Lead as Pb Magnesium as Mg Manganese as Mn Nickel as Ni Potassium as K Sodium as Na Zinc as Zn Silver as Ag Strontium as Sr	APHA 3111-B

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued)		
• Effluent / Water	Arsenic	APHA 3114 C-Continuous Hydride Generation- AAS Method
	Mercury	APHA 3112 B-Cold-Vapor Atomic Absorption Spectrometric
	Tin	In-house method No. 1 based on APHA 3114-C- Continuous Hydride Generation- AAS Method
	Selenium as Se	APHA 3114-C
	Preliminary Treatment of Samples : Digestion for Metals	APHA 3030-D
	Preliminary treatment of Samples: Nitric Acid Digestion	APHA 3030-E
	Suspended Solids	APHA 2540-D
	Total Dissolved Solid Dried at 180°C	APHA 2540 C
	Total Solid	APHA 2540 B
	Mixed Liquor Suspended solids (MLSS)	In-house method No. 8 based on APHA 2540 D
	Mixed Liquor Volatile Suspended Solids (MLVSS)	In-house method No. 9 based on APHA 2540 E

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring • Sewage	Biochemical Oxygen Demand (BOD)	APHA 5210 B/ 4500 O-G
	Chemical Oxygen Demand (COD)	APHA 5220 C
	Oil & Grease	APHA 5520 B
	Phosphorus as P Phosphate as PO_4	APHA 4500-P, B APHA 4500-P, C
	Suspended Solids	APHA 2540-D
	Ammonia as NH_3	APHA 4500 NH3 - B, C
	Nitrate as N as NO_3	APHA 419D (14^{th})
	Total Nitrogen	In-house method No. 7 based on [APHA 4500 Norg A, APHA 4500 Norg B, APHA 4500 NO2B, APHA 4500 NH3 B, C, APHA 419 D (14^{th})] by calculation
	pH	APHA 4500-H^+ B
• Water / Effluent / Sewage	Phosphorus as P (or PO4)	APHA 4500 P, B, F
	Nitrate as N (or NO3)	APHA 4500 NO3 F APHA 4500 NO3 D
	Nitrite as N (or NO2)	APHA 4500 NO3 F
	Cyanide	APHA 4500 CN E
	Ammoniacal Nitrogen	APHA 4500 NH3 G APHA 4500 NH3 D
	Fluoride	APHA 4500 F C
	Phenol	USEPA 420.4 Rev 1.0
	Color	APHA 2120 C
	COD	APHA 5220 D

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SCOPE OF TESTING: CHEMICAL

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Rubber / Palm Oil Mill Effluent	Biochemical Oxygen Demand	DOE Malaysia Alternative Method
	Chemical Oxygen Demand	DOE Malaysia Reference Method
	Suspended Solids	DOE Malaysia Alternative Method
	Oil & Grease	DOE Malaysia Reference Method
	Ammoniacal Nitrogen	DOE Malaysia Reference Method
	Total Nitrogen	DOE Malaysia Reference Method
• Sediments, Sludges, Soil & Solid Waste	Cadmium as Cd Chromium as Cr Copper as Cu Iron as Fe Manganese as Mn Nickel as Ni Lead as Pb Zinc as Zn Calcium as Ca Magnesium as Mg Potassium as K Sodium as Na	APHA 3111-B
	Moisture content	OSRMA p.472 (By calculation)
	Solid content	OSRMA p.472
	Organic content	OSRMA p.472
	Inorganic content	OSRMA p.472 (By calculation)
	Acid Digestion of Sediments, Sludges & Soils	EPA 3050 B
	pH	EPA 9045 D

Signatories:

1. **Kan King Choy** — **IKM No.: L/0797/1886/88** **(Non-resident)**
2. **Lee Foon Lin** — **IKM No.: M/2150/4086/00/04**
3. **Ng Choon Yee** — **IKM No.: M/2132/4619/04**
4. **Zuraini binti Mohamed Isa** — **IKM No.: M/5082/8346/19**

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SCOPE OF TESTING: CHEMICAL

SITE: CATEGORY I

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Ambient	Ambient Air- Determination of Total Suspended Particulates (TSP)	AS 2724.3
	Ambient Air – Determination of Particulate Matter (10 µm) (PM_{10})	In-house Method-Air-No. 6 (based on USEPA 40 CFR Part 50 Appendix J)
	Ambient Air- Determination of Particulate Matter (2.5 µm) ($PM_{2.5}$)	In-house Method-Air-No. 5 (based on USEPA 40 CFR Part 50 Appendix L)
	Ambient Air- Determination of Particulate Lead (Pb)	AS 2800 - 1985
	Nitrogen Dioxide (NO_2) in the Atmosphere	ISC 408
	Sulphur Dioxide (SO_2) in the Atmosphere	ISC 704A
	Suspended Particulate Matter – PM10	AS 3580.9.6 - 2015
Industrial Hygiene	Lead by Flame AAS	NIOSH 7082
	Cadmium and Compounds, as Cd	NIOSH 7048
	Chromium and Compounds, as Cr	NIOSH 7024
	Copper (dust and fume)	NIOSH 7029
	Iron	In-house method-Air-No.1 (based on NIOSH 7030)
	Manganese and compounds, as Mn	In-house method-Air-No.2 (based on NIOSH 7030)
	Nickel and Compounds, as Ni	In-house method-Air-No.3 (based on NIOSH 7030)
	Zinc and Compounds, as Zn	NIOSH 7030

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SCOPE OF TESTING: CHEMICAL

SITE: CATEGORY I

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Stack / Flue Gas	Determination of Particulate Emissions from stationary sources	EPA 40 CFR 60, App. A, Method 5.
	Determination of Sulfur Dioxide emissions from stationary sources	EPA 40 CFR 60, App. A, Method 6.
	Determination of Nitrogen Oxide emissions from stationary sources	EPA 40 CFR 60, App. A, Method 7.
	Determination of Sulfuric Acid mist and Sulfur Dioxide emissions from stationary sources	EPA 40 CFR 60, App. A, Method 8.
	Determination of metals emissions from stationary sources	EPA 40 CFR 60, App. A Method 29
	Determination of Hydrogen Halide and Halogen Emissions from stationary sources	In House Method No. 2 based on EPA 40 CFR 60, App. A, Method 26A
	Determination of concentration & mass flow of particulate matter in flue gas for stationary source emissions	MS 1596 : 2003
	Determination of Carbon monoxide	In-house method Air No. 5 based on manufacturer's Measurement Procedures
	Determination of Carbon dioxide	In-house method Air No. 6 based on manufacturer's Measurement Procedures
	Determination of Oxygen	In-house method Air No. 7 based on manufacturer's Measurement Procedures
	Determination of Nitrogen dioxide	In-house method Air No. 8 based on manufacturer's Measurement Procedures

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SCOPE OF TESTING: CHEMICAL

SITE: CATEGORY I

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring (continued)		
• Stack / Flue Gas	Determination of Nitrogen oxide	In-house method Air No. 9 based on manufacturer's Measurement Procedures
	Determination of Sulfur dioxide	In-house method Air No. 10 based on manufacturer's Measurement Procedures
• Smoke	Determination of dark smoke emissions from chimney using Ringelmann Smoke Chart	BS2742:2009
• Ambient	Determination of oxidizing substances in the atmosphere	ISC 411
	Determination of Carbon monoxide (CO) in the atmosphere	ASTM D4599-90
	Determination of wind velocity and direction measurement	In-house method Air No. 11 based on manufacturer's Measurement Procedures

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2. **Lee Foon Lin** — **IKM No.: M/2150/4086/00/04**
3. **Ng Choon Yee** — **IKM No.: M/2132/4619/04**

SCOPE OF TESTING: CHEMICAL

SITE: CATEGORY I

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Environmental Monitoring		
• Effluent / Water	pH	APHA 4500 H^+ B
	Temperature	APHA 2550 B
	Dissolved Oxygen	APHA 4500 O G
	Conductivity	APHA 2510 B
	Turbidity	APHA 2130 B
• Sewage	pH	APHA 4500 H^+ B
	Temperature	APHA 2500 B
• Noise Measurement	Acoustics- Description and Measurement of Environmental Noise	ISO 1996/1
• Air	Measurement of Methane, Carbon Dioxide, Oxygen, Nitrogen, Hydrogen Sulphide, & Carbon Monoxide using Portable Gas Analyser	In-house method-Air-No.4 (based on Manufacturer's Measurement Procedures)
• Ground Vibration	Measurement of Ground Vibration using Vibrometer	In-house method-Vibration-No. 1 based on Manufacturer's Measurement Procedures (Instantel Minimate Plus™ Vibration)

Signatories:

1.	**Kan King Choy**	**IKM No.: L/0797/1886/88**	**(Non-resident)**
2.	**Lee Foon Lin**	**IKM No.: M/2150/4086/00/04**	
3.	**Ng Choon Yee**	**IKM No.: M/2132/4619/04**	
4.	**Zuraini binti Mohamed Isa**	**IKM No.: M/5082/8346/19**	**(Effluent/ Water & Sewage)**

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SCOPE OF TESTING: MICROBIOLOGY

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Methods/ Equipment/Techniques
Effluent / Water	Heterotrophic Plate Count / Total Plate Count - Pour Plate Method	APHA 9215 B
	Heterotrophic Plate Count / Total Plate Count - Spread Plate Method	APHA 9215 C
	Heterotrophic Plate Count / Total Plate Count - Membrane Filtration Method	APHA 9215 D
	Total Coliform (MPN) Method	APHA 9221 B
	Fecal Coliform (MPN) Method	APHA 9221 E
	E. coli (MPN) Method	In-house method-Microb-No. 3 (based on APHA 9221 E)
	Total Coliform (Membrane Filtration)	In-house method-Microb-No. 1 (based on APHA 9222 B)
	E. coli (Membrane Filtration)	In-house method-Microb-No. 2 (based on APHA 9222 G)
	Fecal Coliform (Membrane Filtration)	APHA 9222 D
	E. coli (MPN) Method	APHA 9221 F
	Enterococci	APHA 9230 C
Food	Aerobic Plate Count / Total Plate Count (Spread Plate and Pour Plate Method)	FDA-BAM Chapter 3
	Yeast and Mold - Spread Plate Method	FDA-BAM Chapter 18
	Coliform (MPN) Method	FDA-BAM Chapter 4
	Fecal Coliform (MPN) Method	FDA-BAM Chapter 4
	E. coli (MPN) Method	FDA-BAM Chapter 4
	Staphylococcus aureus	FDA-BAM Chapter 12

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SCOPE OF TESTING: MICROBIOLOGY

Signatories:

1.	**Afiqah Liyana binti Zaimi**	**MJMM 0499**
2.	**Lee Foon Lin**	**MJMM 0502 & authorization under SAMM Circular 1/2015**
3.	**Ng Choon Yee**	**MJMM 0500 & authorization under SAMM Circular 1/2015**

Note:

APHA	-	Standard Method for the Examination of Water and Wastewater, 21st Edition, 2005 (American Public Health Association)
OSRMA	-	Official, Standardised & Recommended Methods of Analysis, 2nd Edition, 1973, Society of Analytical Chemistry
ASTM	-	1993 Annual Book of ASTM Standards, Volume 11.01
AS	-	Australia Standard
ISC	-	Methods of Air Sampling & Analysis, 3rd Edition, 1990, Inter Society Committee
ISO	-	International Organization for Standardization
EPA 40 CFR 60, App. A	-	Environmental Protection Agency, Code of Federal Regulations, Title 40, Part60; Appendix A to Part 60 – Test Methods, 1/7/1998 (Using Graseby-Anderson Universal Stack Sampler)
FDA-BAM	-	U.S Food & Drug Administration, Bacteriological Analytical Manual, 2003
DOE (M) Methods	-	Revised Standard Methods (1985) for Analysis of Rubber and Palm Oil Mill Effluents, 2nd edition, 1995.

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